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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/584,315

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EXAMINER

CONNELLY CUSHWA, MICHELLE R

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/584,315	Applicant(s) FACCIO ET AL.	
	Examiner MICHELLE R. CONNELLY CUSHWA	Art Unit 2874	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 26-50 is/are pending in the application.
 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 26-44 and 47-50 is/are rejected.
- 7) ☒ Claim(s) 45 and 46 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 June 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>06/23/06,01/09/07</u> . | 6) <input type="checkbox"/> Other: ____. |

DETAILED ACTION

Information Disclosure Statement

The prior art documents submitted by applicant in the Information Disclosure Statements filed on January 9, 2007 and June 23, 2006 have all been considered and made of record (note the attached copies of form PTO-1449).

Drawings

Thirteen (13) sheets of formal drawings were filed on June 23, 2006 and have been accepted by the Examiner.

Specification

Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 26- 44 and 47-50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kuipers et al. (WO 02/103448 A2).

Regarding claims 26, 37 and 48; Kuipers et al. discloses a low loss micro-resonator device (see Figure 10 and page 15, line 18, through page 16, line 19), comprising:

- a closed-loop resonator (polymer disk, 78, which may alternatively be a ring resonator; page 15, line 33) having a first refractive index, the resonator waveguide defining an inner and an outer region by an outer curved edge of the waveguide, the resonator waveguide being arranged on a substrate (70, 72, 74 include layers of a substrate) having a second refractive index, there is inherently a refractive index between the waveguide and the substrate in order for the light to be confined within the waveguide;
- an upper cladding (polymer cladding, 80) covering the inner region of the resonator waveguide having a third refractive index; and
- a lateral cladding (air, 86) in contact with the outer curved edge and extending in the outer region, the lateral cladding (air) having a fourth refractive index, the fourth refractive index being lower than the third refractive index.

Kuipers et al. does not specifically state that the refractive index difference between the first refractive index and the second refractive index is greater than 0.3. It would have been obvious to one having ordinary skill in the art at the time the invention was made to have the refractive index difference between the first and second refractive indexes be greater than 0.3 in order to efficiently confine light within the waveguiding portion of the device, since it has been held that where the general conditions of a claim

are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art (*In re Aller*, 105 USPQ 233), since it has been held that discovering the optimum value of a result effective variable involves only routine skill in the art (*In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980)), and since the refractive index difference between a waveguide and substrate is a well known variable that effects optical waveguide efficiency.

Regarding claims 27 and 50; the upper cladding (polymer cladding, 80) comprises a tunable material (see page 16, lines 11-19).

Regarding claim 28; for a resonator that resonates at a particular wavelength, as disclosed by Kuipers et al., at least one of the dimensions of the cross-section of a closed-loop resonator waveguide is on the order of the wavelength / effective refractive index for a wavelength of propagating mode in the resonator waveguide.

Regarding claim 29; waveguides (76) are in substantially close proximity to the resonator waveguide (28) in a predetermined region to provide coupling there-between (see Figures 6 and 10).

Regarding claim 30; Kuipers et al. does not state whether the resonator waveguide is a single-mode or a multi-mode waveguide, however, one of ordinary skill in the art would have found it obvious to form the resonator waveguide as a single-mode waveguide in order to reduce or eliminate modal interference within the optical device and/or to obtain the desired transmission properties when coupling the device to either a single-mode or multi-mode waveguide at the input/output ports of the device.

Regarding claims 31 and 42; Kuipers et al. does not teach that the waveguide resonator is formed of silicon compound materials. However, one of ordinary skill in the art would have found it an obvious alternative to form the waveguide resonator from well known, commonly used silicon compound materials, in order to obtain the desired transmission and/or tunability properties for the resonator, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice (*In re Leshin*, 125 USPQ 416). Additionally, it is noted that many silicon compound materials are tunable with an electric field and that one of ordinary skill in the art would have found this an obvious alternative to the thermally tunable polymer materials disclosed for Kuipers et al. for situations where a thermally tunable device is not desirable because of the required temperature variation.

Regarding claim 32; the substrate comprises silicon compound materials.

Regarding claim 33; see Figure 6.

Regarding claim 34; Kuipers et al. does not explicitly state that the input signal comprises a given number of optical channels having wavelengths of about 1530 to about 1565 nm. However, one of ordinary skill in the art would have found it obvious to use the device of Kuipers et al. with an input signal having wavelengths ranging from 1530 to 1565 nm because these wavelengths are commonly used in optical communication systems in the art.

Regarding claims 35 and 36; One of ordinary skill in the art would have found it obvious to scale the resonator appropriately in order to allow the desired wavelength to

resonated within the resonator, and accordingly, would have found it obvious to provide a closed-loop resonator with a radius of 5 to 10 micrometers or not larger than 8 micrometers, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art (*In re Aller*, 105 USPQ 233) and since it has been held that discovering the optimum value of a result effective variable involves only routine skill in the art. (*In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980)).

Regarding claims 38 and 39; the waveguides (76) are arranged below and laterally offset from the resonator (78) in a lateral and vertical coupling configuration. It is noted that Kuipers et al. discloses that the waveguides may be laterally offset or vertically offset from the resonator on page 14, lines 25-33.

Regarding claims 40 and 41; the third refractive index is varied by an external parameter (temperature; see page 14, line 7, through page 15, line 17), wherein the third refractive index varies with temperature and a ratio between the variation of the third refractive index and the refractive index of the tunable material is not smaller than 10^{-2} for a temperature variation not larger than 100 degrees Celcius (see Figure 9 and page 14, line 7, through page 15, line 17).

Regarding claim 43; see page 16, lines 9-19.

Regarding claim 44; the tunable material is a polymer.

Regarding claim 47; see Figure 6.

Regarding claim 49; Kuipers et al. does not disclose the step of forming the lateral cladding by depositing a layer of material on the outer region, but on page 4,

lines 16-19, Kuipers et al. teaches that the resonator may be bounded by a cladding material as an alternative to the air gap. Thus, one of ordinary skill in the art would have found it obvious to provide another low index material in place of air in order to provide more structural integrity to the device and would have additionally found it obvious to deposit the material on the outer region, as deposition is a well known and commonly used step for applying material to small areas of optical devices.

Allowable Subject Matter

Claims 45 and 46 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: the prior art of record does not disclose or render obvious a resonator device as defined in claim 45, wherein the tunable material is a liquid crystal, or as defined in claim 46, wherein the lateral cladding comprises a tunable material in combination with the limitations of the base and intervening claims.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure: Scheuer et al. (US 6,885,794 B2) and Al-hemyari et al. (US 6,636,668 B1).

Any inquiry concerning the merits of this communication should be directed to Examiner Michelle R. Connelly-Cushwa at telephone number (571) 272-2345. The examiner can normally be reached 9:00 AM to 7:00 PM, Monday-Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Rodney B. Bovernick can be reached on (571) 272-2344. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Any inquiry of a general or clerical nature should be directed to the Technology Center 2800 receptionist at telephone number (571) 272-1562.

/Michelle R. Connelly-Cushwa/
Patent Examiner
March 24, 2008